



DISCUSSION

Idea to Market: From an Institute Platform

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ABSTRACT

The staff, technicians and students of Sreyas Institute of Engineering & Technology wanted to establish a platform for the students to get some industrial experience during the course period. Refrigeration & Air Conditioning, R&AC, was chosen as the area. A three year work has been initiated with support from JNTUH EDC, Entrepreneur Development Cell & (Micro, Small & Medium Enterprises) MSME, who have supported by providing a grant. The idea of developing a “Sreyas Mobile Air Conditioner” was incubated. This idea was converted to prototypes with the help of (multi National Company) MNC, Tecumseh Products Ltd. and financial & moral support from the management of the Institute. The challenge taken by Sreyas staff & students of the Mechanical Engineering Department has provided an idea to market the product from our institute.

Keywords: Idea, Innovation, Incubate-Seed, Commercialize, Entrepreneur.

1. INDUSTRY–INSTITUTE-PRODUCT DEVELOPMENT: A VIEW

Engineers provide products or services for the betterment of all living beings in general and for human life in particular. As per Darwin’s theory, the human species upgraded their cerebral abilities from generation to generation. From the stone age, a stone shaped tool used for killing the prey for easy daily food, gave hold for man over the other physically powerful animals; that innovative brain of man paved the path of engineering and technology of the day.

From a wheel to locomotive, to electric motor, to automobile, to aircraft, to heart replacement, to cloning, to a nuclear bomb, to automation, robotic controlled factories, a digitally run smart world is under way. With such a vast and advanced development on one hand, we still have humans living no better than animals in many parts of the world. Such disparity attributed to the political & geographical reasons remains a shame and questions the reality of technology, development &

research carried on throughout the world. As usual, every problem leads to a world of opportunities to the young minds of engineers.

Innovation is bringing about changes of existing products/services for better performance, cost, quality, and reliability, delivery to fulfil the known and expressed or the unknown and unexpressed needs. Innovation brought out competition for business, competition among the companies of different countries to capture the global market and corporate culture of the cut throat competition at the cost of environment, ethics, culture, human values etc. Self-destruction has brought the world to the threat of limited supply of air, water, food, shelter – the basic needs of survival.

Today’s industry is fighting against time, to catch up with their goals and bench marks. A definite customer-driven process, but causing nightmares for the managers and owners to withstand the pressures as there is a limit to the extent of stretching a product or service before the next path breaking idea takes over by Edward et al.

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[1] has given many a process of how the mind functions and to groom it to the benefit of lateral thinking. Every time we register some experiences strongly, our mind registers that as the correct method, gets fixed to it; and, it does not allow us to think of an alternative. The ability to erase the earlier experiences, the established roads of thinking and allowing new ideas to be generated is lateral thinking. We should always feel like Alice [2] who gets lost in the forest and finds herself at the cross roads. Not knowing which way to take but has the confidence to explore and reach destination by travelling in the chosen path. For an innovator, like Alice, there will be challenges and failures but surprisingly good destinations await the brave. India was always good in Mathematics & sciences, but lacked applications. We have a lineage of good genes [3-5], with good culture, values and trained youngsters.

Industry needs to catalyze its ideas with young minds in the institutes. They should share their problems and assist in the ongoing developments. The result will be innovations. Figure 1 shows the trend in the global innovations. Small countries like Switzerland, Sweden, and Norway lead innovations and are ahead of US & UK in terms of innovations. Worldwide, India ranked 60th and has topped the region of central & southern Asia. A good beginning indeed! But there is a long way to go to the top. At Sreyas the students are motivated to modernize their ideas to be brought to the market. This paper is intended to share three years of experience of bringing 'Sreyas Mobile Air Conditioner,' from idea to market.

1.1. Product selected

White goods are electromechanical devices which provide comfort to human life. Examples include air conditioners, refrigerators, washing machines etc. In this scenario, the area of climate control for human comfort was chosen to motivate the engineering students and to bring out their ideas to the fore. An air conditioner comes basically as a room as

- Window mounted
- Split wall mounted
- Packaged corner mounted
- Ducted etc.

All these products cool a space of volume, and now-a-days compete on the energy star rating.

Cooling of a room is measured in Tons refrigeration, amount of heat removed. 1Ton =12000BTU/hr or 1 tonne, Ton of refrigeration is the rate of heat removal required to freeze a metric ton (1000 kg) of water at 0°C in 24 hours. Based on the heat of fusion being 333.55 kJ/kg, 1 Ton of refrigeration = 13,898 kJ/h = 3.861 kW. For example, 1 ton room air conditioner can cater to a room of width X Length X Height =10 X 10 X 10 feet = 1000Cubic Feet, CF.

Figure B1 shows the room size selection in sub 1 Ton and more than 1 Ton air conditioners. Typically, in tropical regions a 1 Ton AC provides comfort to a 10*10*10 room equitant to a 1000 cubic feet of space. Energy Efficient Ratio (EER) is the measure of cooling capacity in BTU/Hr divided by power consumed in Watts as shown in equation in (1.1).

$$\text{EER} = \frac{\text{Btu}}{(\text{Hr. W})} \quad (1.1)$$

Btu British Thermal Unit per hr unit Watt



Figure 1.Global innovation scenario from net

EER is the measure used for energy star rating. Power consumed by a room air conditioner of different tonnage is compared with a 0.75 (Sreyas Mobile Air Conditioner) SMAC. It is noted that by the nature of construction of ACS, the higher the tonnage, the higher the EER as losses get distributed. The purpose of 0.75 SAMC design and its main customers can be understood from figure B2.

In Figure B2, power consumed by a typical 3 star rated air conditioner is shown as a linearly increasing blue line. For a 1 Ton AC, 1000Watts or 1 KW power is consumed. A 0.75 Ton, SMAC consumes 1100 Watts of power. This air conditioner provides spot cooling for about 750 cubic feet of area in front. So irrespective of the room size, a region of volume of the room is cooled and Sreyas mobile AC can be moved in position to give comfort to the area of persons as required. As the name suggests, it is changed as required. So this model is an alternative to the commercial fixed positioned air conditioners available today.

Customers who would require 0.75 SMAC are:

- Those who have small space, like business offices in urban areas.
- Small huts would be ideal as they have natural insulated thatched roofs, TVs and fridge. If power consumption is reasonable, they would have ACs too.
- Rural areas where there is no easy access to AC technicians, to install, dismantle, serve and maintain.
- Useful for tenants. No hazard of approval for fitting on to windows or walls. Also, it saves the installation & dismantling costs.
- Where rooms are big but need to cool specific regions. Like a Chairman's room say 20000 cubic feet even if a 5 star rating AC is used, more than 15 Units per hour will be consumed. But, with SMAC near to the Chairman's space, it can be cooled with about 1.1 Units per hour.

1.2. 0.75 SMAC model

Developed at Sreyas Institute of Engineering & Technology, Department of Mechanical Engineering, the staff, students and the industry have put over 1000 Man hours and about 10 prototypes to develop a mobile air conditioner. Basic replacement will be an air cooler, whose disadvantages are as follows:

- Increases the humidity in the room.
- Has less cooling as it depends on the latent heat of vaporization of water, which is less compared to a refrigerant. To compensate more air flow in, forced convection is used creating noise.
- It is an open cycle in terms of water usage and needs to refill the tank
- Hygiene factor of stagnant water causing bacteria & mosquito breeding.
- Used husk gives a rotten smell, which can be injurious to breathing system.

The replacement SMAC is with 5 years warranty. The cost is worked out to be below Rs 20000 with additional taxes as per norms. A model of SMAC, in testing, is seen in Figure B3.

2. TO DEVELOP INDUSTRY –INSTITUTE, IDEA TO MARKET TIE UPS

The position of Indian innovations in the world is shown in Figure 1. Indian Industry, by tradition was small scale and included skilled artisans, handicrafts and family businesses. Having had a close economy till 1992, global competition was not known to many traders. Patenting started recording creativity and gaining market position by converting ideas to innovations as products and services, incubate for business, obtain seeding support and transform to a company.

Another more interesting and important aspect bothering the Indian industries today is the global competition in terms of cost, quality, delivery, reliability, branding, global reach etc. "Innovate or perish" is the topical slogan. In this respect China has mastered and occupied an enviable global position of exports of Chinese goods. They started as a cheap destination for making. Through innovations and reverse engineering and government policy for exports, they have reached a commendable position, difficult to compete by any other country. Denying business, "not buying Chinese products" is a very weak policy by any government. We should become industrially better than all the global competitors. Figure B4 shows different functions of the Institute.

Industries in India are mostly fire fighting. Very few have R&D of their own, very few have the knowledge of facing competition globally. We are born with intelligence [3-5]. However, we do not top the world's innovations. We cannot excuse the lack

of latest resources; otherwise, we will always lag behind.

Lateral Thinking [1] has very clearly stated that innovation is not necessarily a god's gift or attained only through genes; but, it can be groomed by practicing to think beyond what is obvious.

3. SREYAS INNOVATIONS AND INCUBATION PROCESS

In the area of refrigeration and air conditioning we have core competence. With over 23 years of experience in R&D, Quality at Tecumseh product company, Dr. Suresh Akella submitted a proposal for air conditioners to JNTUH-Incubation Centre, promoting entrepreneurship in 2012. This is a TED under DST grants and in association with MSME and the proposal was granted in 2013. In this proposal, Sreyas Institute of Engineering and Technology has been a partner and has given full support to build the technology to develop the products of air conditioning and refrigeration and testing to bring out the ideas into the market.

A registered company "Akella Systems Pvt. Ltd." has tied up with the Sreyas Institute to develop "Sreyas Portable Air Conditioners." The objective of this association is to involve the students from the development up to marketing this product. The Association would benefit the students, staff and Akella Systems as shown in Figure B5. It is an attempt to inculcate practical training in the College. We are fortunate to have Mr. K. Sainath to have taken his Ph D project in this area, followed by a few M Tech and B Tech Projects. We have groomed B Tech students to learn R&AC and take mini and major projects.

We are also associated with Tecumseh Products Limited for Technical support from their company's Department of Marketing and Customer Care Services. We have an expert Mr. Aravind Kumar coming to our factory for the last three years; and, he helped us build the Psychometric Lab and a build number of prototypes. Thirty years of experience and his expertise in tube bending, cutting, brazing, gas charging etc. have been excellent guidance to our technical staff & students. Our technicians from mechanical lab Prakash and Khaza are experts in welding and did all the fabrication work. Similarly, Das and Radha Krishna has the knowledge of fitting and assembly that was used effectively. Mr. Ram Mohan had over 30 years

of experience in the field of electrical engineering and it was useful for all the electrical tests. On the whole, a very efficient and competent technical team has been formed including the staff and supported by the students.

We have association with ISHRAE and three projects:

- A roll bond evaporator for UPS batteries cooling, roll-bond Patent with Annapurna.
- A split water cooler for hot and cold water
- An R134a eco-friendly SMAC. Developed vendors for fibre glass parts and sheet metal parts.

The activities of our 3 years effort in R&AC Incubation Centre is shown in figure B6. There are few more steps to commercialize the product. In table A1, a summary of what is possible at Sreyas R&AC Incubation Centre is shown. From the Table it is seen that developing a business in industry is limited by manpower, latest technology and focused work. On the other hand, an institute is limited to vendor development, business tactics, financial management etc.

Industry knowledge, focus and drive have to be brought to the commercialization activities in the institute. Items 9 to 16 in the Table A1 high light the present weaknesses. There will be a planned program to strengthen the vendor development, finances and business strategy.

4. CONCLUSION

A sincere effort is made at Sreyas Institute of Engineering, Nagole, Hyderabad to establish a business centre with an idea to market the products. As on today, there is no mobile AC manufactured in India. A cost effective model has been developed. A three year effort has brought out an R&D centre. CAD drawings, quality and core technical competence has been developed. Field trial models will be made after successful approval from field. A product launch is planned to take place in January 2018.

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APPENDIX A

Table A1.Industry-Institute comparison in a business scenario

S No	Area Available in MNC/ Industries	Available at Sreyas	Remarks
1.	Identifying customer needs, can employ professionals for survey.	Self-assessment	Will help if Industry passes those which they cannot handle to Institute.
2.	Established R&D centers with full test facilities. Manpower is limited, need to prioritize their projects, may miss some important ones	Develop minimum resources. Faculty & Students can focus as they have time bound projects. Manpower is large, can take up job	Most important to develop Win-Win associations. Industry is time bound has core competence, Institute has man power & can focus.
3.	Latest CAD CAE is available	To develop students of each batch, experience will be lost.	Staff is to be entrusted the job on contract basis.
4.	Special test facilities	Not available	Students to be given internship
5.	Quality department with laid down procedures for testing	Psychometric room, GD&T drawings, Taguchi methods of on line- off line processes	Some MNCs are at 6-Sigma quality levels. Institute has expertise in SQC.
6.	Project funds & time lines well defined.	Possible if specific projects are undertaken	Major concern for Industry. Deliverables to be adhered to by institute
7.	Well established vendors	Is a handicap, depend on net.	Industry should help. For new products even Industry need to develop.
8.	Assembly & Testing Processes Industry has core strength.	Will struggle	Proto types should be in Industry.
9.	Vendor development, Known vendors are established. MNC have global vendor development.	Should take assistance from Industry	
10.	Packing, forwarding, logistics	No experience	
11.	Government regulations & rules & Laws to follow well aware.	Very little to no knowledge	
12.	Marketing team, strategies, product positioning, growth plans	None	Unless a very established MBA team is available
13.	Competitive product launch	None	
14.	Business plan for product launch & defining product life cycle	No experience	
15.	Well established finance departments	Will be difficult to obtain & maintain finances	
16.	Management of business with set goals to achieve	No professional experience.	

APPENDIX B

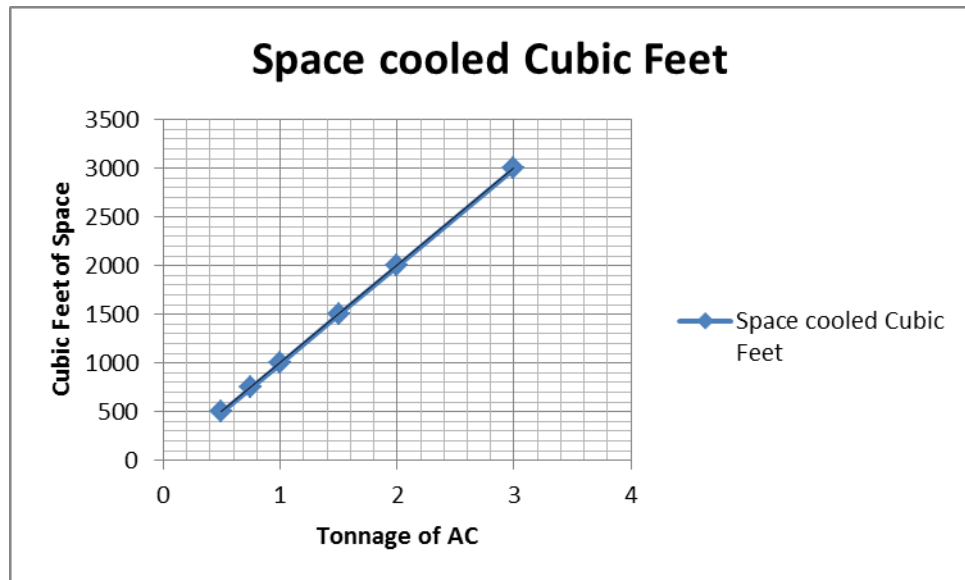


Figure B1.Room air conditioner selection

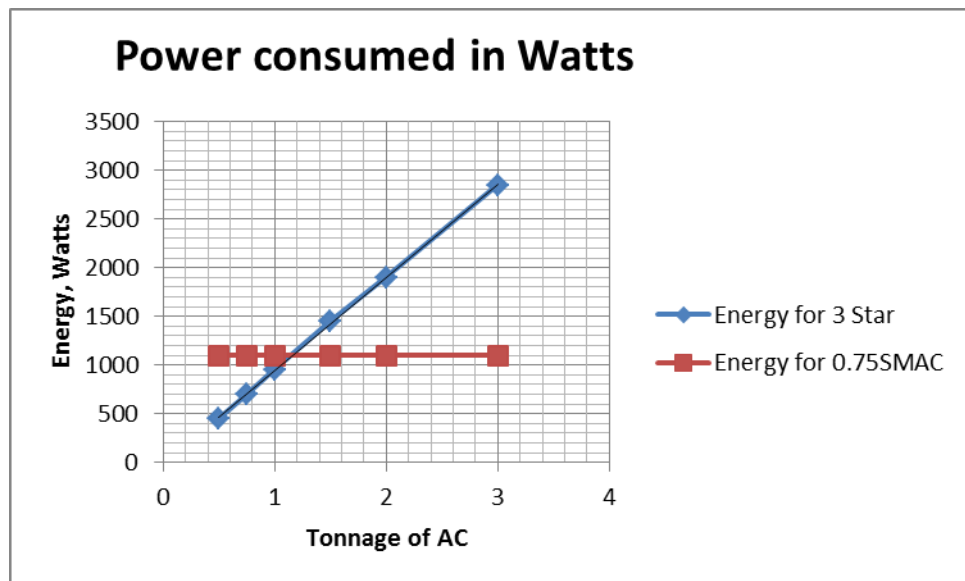


Figure B2.Power benefit of SMAC to replace higher tonnage



Figure B3. Testing of 0.75 SMAC

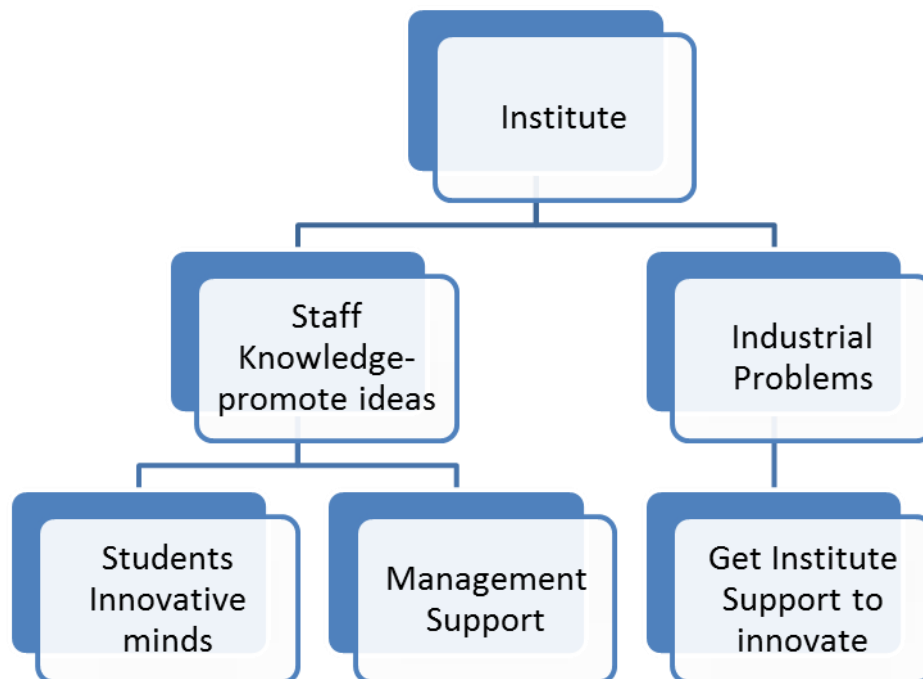


Figure B4. Institute provides ideas and also help industries

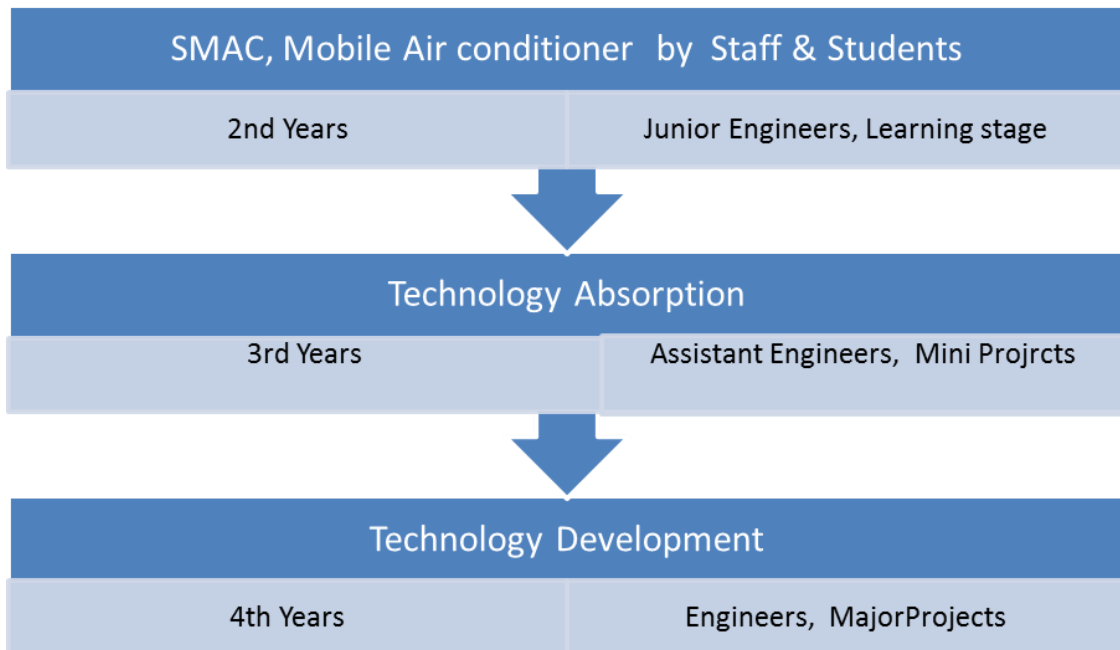


Figure B5.Student skill and entrepreneurship

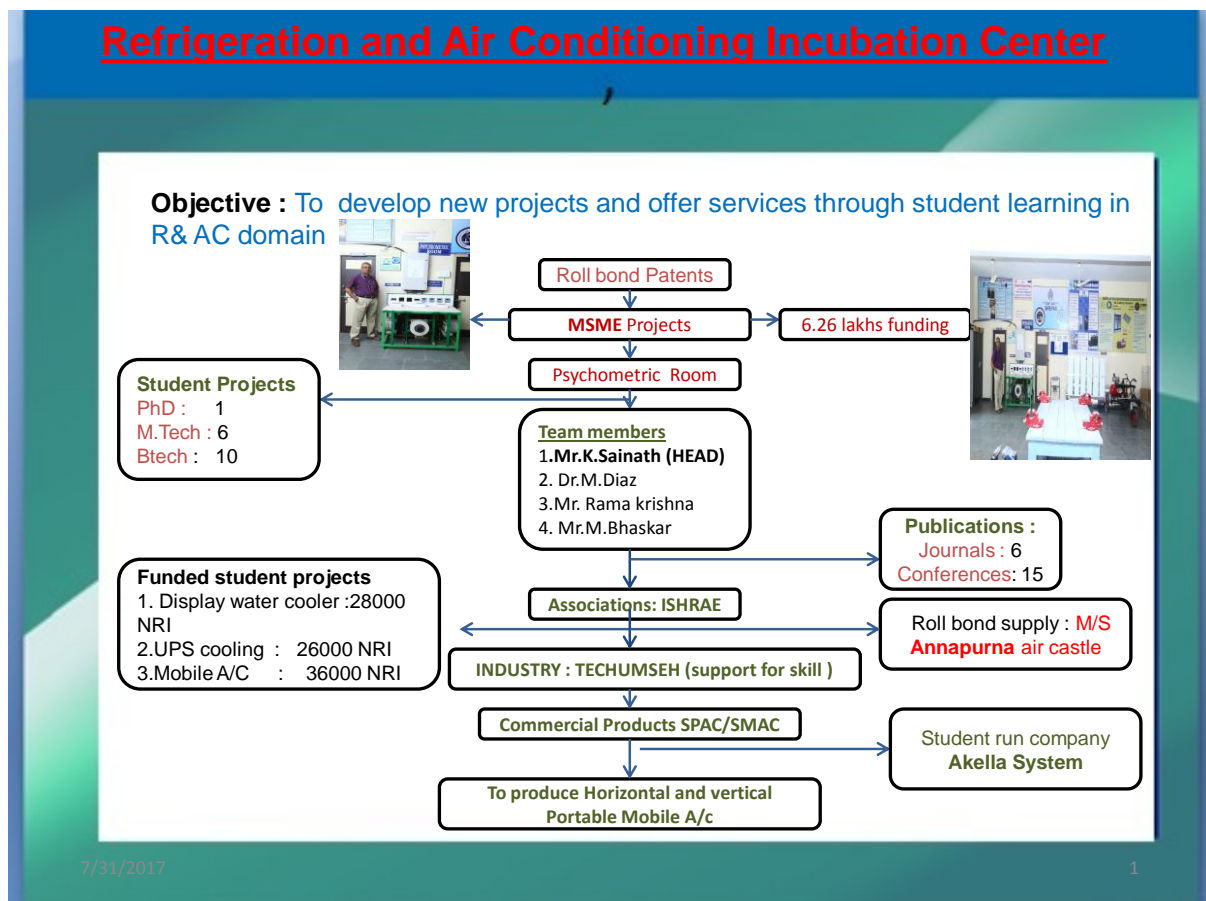


Figure B6.R&AC innovation centre